

OBSERVATIONS
ON THE
SEA- or PILE-WORMS

Which have been lately discover'd to have
made great Ravages in the Pile- or Wood-
Works on the Coast of HOLLAND, &c.

CONTAINING

A particular ACCOUNT of their
Make and Nature, and of the Use of their
several Parts in Boreing and Feeding;
with a particular Description of their Cells
or Lodgments in the Wood.

By Mr. ROUSSET,
Of the Royal Academy of Sciences at Berlin.

*Done from the Original Low-Dutch,
And
Illustrated with Copper - Plates.*

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Fig. A.

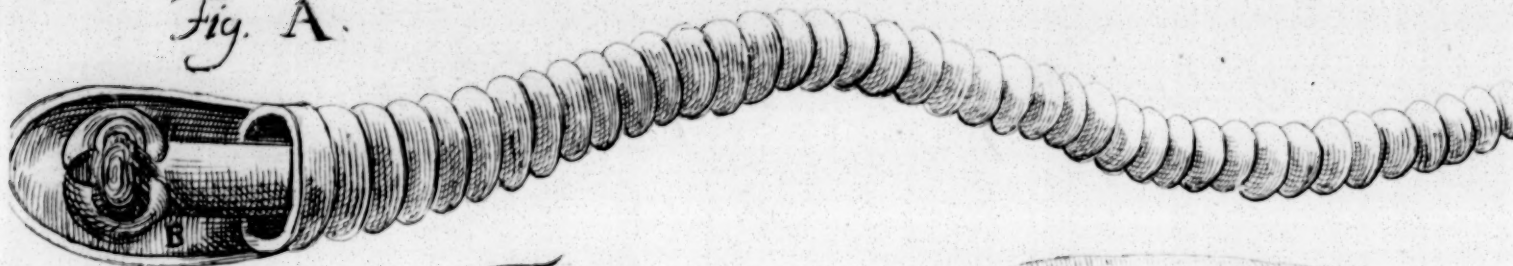


Fig. B.

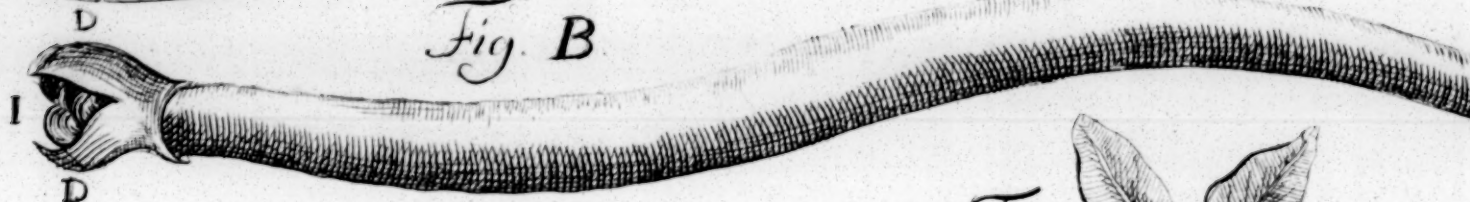


Fig. 7.



Fig. 8.



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 5.



Fig. 9.



Fig. 6.

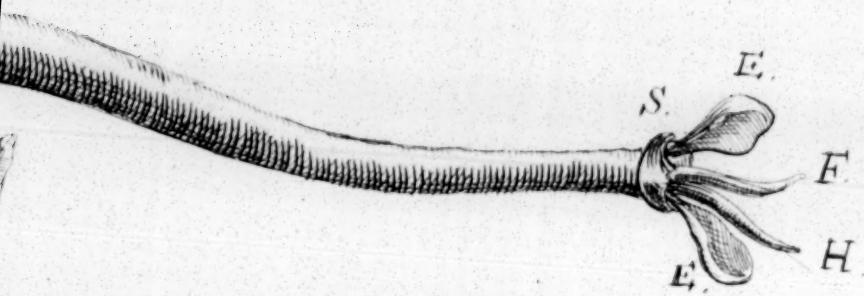
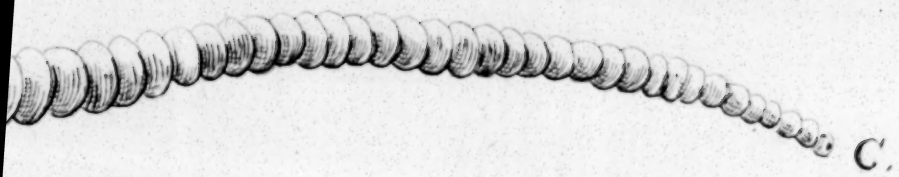


Fig. 3.

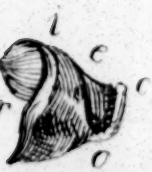


Fig. 4.

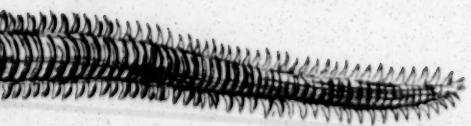


Fig K.





Observations

ON THE

SEA- or PILE-WORMS, &c.



The Damage, which hath been caus'd by certain Sea - Worms, to the Pile-Works of the Dykes of *Zealand*, *North - Holland*, *Friesland*, and the Coast of *Flanders*, hath made so much Noise, that it is no Wonder the Curiosity of the Publick, and particularly of Gentlemen who employ themselves in the Study of Natural Philosophy, hath been awaken'd to look narrowly into this *Phænomenon*.

The Concern and Attention, with which my Duty, as a Subject, inspires me for every Thing that affects the State, have put me upon searching after proper Means for preventing, in Times to come, the Mischief, which hath been occasion'd by these Vermin. But as, before an Engagement for Victory, it is proper to get acquainted with the Nature
and



and Manner of our Adversary, I have
 ted and presented to the Governmen
 of Observations, concerning this Ve
 Enemy. The following is a more
 particular Account of those Observat
 is intended more especially for the P
 Such as have not seen those Wor
 would be inform'd particularly co
 them, as likewise for the refuting an
 of the false Reports on this Subje
 have been spread either by the En
 the Enviars of the Wealth, Prosp
 Happiness of the Republick.

Of these false Reports, which h
 spread from all Quarters, not only b
 Letters, but likewise by Publick
 shall here only give Two Specimens
Bern Courant under the *Hague A*
November 24th 1732, there is the f
 Account:

“ They labour with the utmost
 “ on the Repair of the Dykes of t
 “ tries, which are most damag'd;
 “ wards of Six Thousand Men are
 “ in that Work. The Inhabitants
 “ Villages which are most threaten
 “ Danger, are remov'd with their
 “ Places of Security. There are fo
 “ Time to Time, under the Dy
 “ large Cavities, which have been
 “ the Sea - Worms; the Heads
 “ Creatures are so hard, that they a

ry, I have collected
 government a Set
 of this Vermicular
 a more ample or
 Observations, and
 for the Perusal of
 of these Worms, and
 particularly concerning
 of this Subject, which
 of the Enemies or
 of Prosperity and
 of.

which have been
 not only by private
 Publick Prints, I
 specimens. In the
Hague Article of
 is the following

utmost Diligence
 of the Coun-
 amag'd; and up-
 Men are employ'd
 habitants of those
 threaten'd by the
 of their Goods to
 are found from
 the Dykes, very
 have been made by
 Heads of which
 at they are not to
 " be

" be shatter'd without a Hammer. And the
 " Swarming of these Vermin is a Prodigy
 " beyond Expression

In all this Account there is not one Word
 of Truth. The Writer not only betrays his
 great Ignorance in the Matter of the Struc-
 ture or Contrivance of the Dykes, but like-
 wise his Want of any one true Idea relating
 to the Nature and Make or Shape of these
 Worms. But a more extravagant Account
 of the Matter is the following, which comes
 from the Pen of a celebrated *German* News-
 Writer, whose Papers are to be met with in
 almost all the Courts of *Germany*.

* " The City of *Amsterdam* is on the * Dated
 " Brink of Ruin, in Regard the Houses, *Hague,*
 " which are all rais'd upon Piles, are in *Nov. 14th*
 " great Danger of Falling, occasion'd by the *1732. the*
 " Worms, which have eaten through the *Original*
 " Piles, and thereby render'd them unfit for *I have in*
 " the Support of such a Weight of Build- *my Posses-*
 " ings: Insomuch that all the costly Movea- *sion.*
 " bles and Merchandise, to prevent their
 " being involv'd in the Destruction with
 " which the Houses are threaten'd, which
 " already begin to shake and sink into the
 " Water, are remov'd to Places of most Se-
 " curity. And the Danger is so far aug-
 " mented, that the principal Merchants be-
 " gin to talk of removing from thence in or-
 " der to settle elsewhere. The Inhabitants
 " of Two Hundred Villages, great and small,
 toga-

“ together with those of Six fine Cities,
 “ have been warn’d by the States General to
 “ quit them without Delay, and remove
 “ with their Effects to Places of Safety,
 “ abandoning their Houses and Lands, which,
 “ by the First Flood of the Winter, will be
 “ in Danger of being totally ruin’d and swal-
 “ low’d up by the Waters. The Dykes
 “ are not sufficient to withstand the Weight
 “ and Fury of the Waters any longer. This,
 “ Sir, is a Punishment, &c. — — —
 I purposely omit what follows, as contain-
 ing Remarks that are equally extravagant
 and ridiculous.

The Contents of this Letter are every one
 of them false. Notwithstanding the tempe-
 stuous Winds, which, in the Months of
October, November, and in the Beginning of
December we had from the North-West, the
 Wind at which Quarter is at all Times dan-
 gerous to our Coast; notwithstanding, I say,
 these Storms, neither our Dykes, nor our
 Pile-Works, receiv’d any Injury from them,
 Nothing, in any Part of the Works, having
 been discover’d to be shatter’d, or to give
 Way. Nor were any more, or any other
 Workmen employ’d upon the Dykes than
 Those who are employ’d upon them the
 Year round. And for what I have recited
 here concerning the Piles under the Houses
 of *Amsterdam*, a Man must certainly be be-
 liev’d of his Senses to publish such Stuff,
 since

since the Pile-Worms cannot live in Fresh Water, such as is the Water about *Amsterdam*; nor do they live either in Water or the Earth, but in Wood only. And, finally, touching the Piles, under the Houses, being damag'd by the Worms, the Houses must certainly have been pull'd down before any Discovery could be made of such a Matter.

These Worms are no new Things on our Coast. Many Persons remember to have seen Worms of the same Kind about Fifty Years ago. But These appear'd not till after the Dog-Days: And a severe Winter following, it destroy'd both them and the Seeds of them, before they became of any considerable Bigness. They are known likewise upon the Coasts of *France* and *Italy*: And I find they have been taken Notice of by some learned Writers. The History of the *French Academy* of Sciences for 1720, gives an Account of the Observations made by M. *Deslandes*, a Physician, on the Worms at *Brest*, which Worms the *French* think were brought thither from the Islands of the *Antilles*.

The Account runs thus: * “ He took * *See the*
 “ some of the Outward Planks of a Ship, *Part for*
 “ which were about 10 or 12 Feet long, and *1720. printed at Am-*
 “ about 4 or 5 Inches thick. He observ'd, *sterdam in*
 “ that small Holes, of about the Diameter *Duod. p.*
 “ of a || Half-Line, were gnawn † into the *34.*
 “ Super- *† See Fig. K. N. N.*

|| NB. The Pack-thread- Spinners make a Sort of Line which they call a *Line*; another Sort they call a *half Line*; and another which they call a *Quarter-Line*.

“ Superficies or Outsides. And upon his tak-
 “ ing off the Outsides, he saw, that the In-
 “ sides were wholly wasted by these Worms;
 “ and there likewise he found the Worms
 “ themselves. They are, says he, Half a Foot
 “ long, or somewhat less. The whole Body
 “ consists of divers Rings. On each Side of
 “ the Belly they have innumerable Legs,
 “ which are all arm’d with little Hooks.
 “ But the most remarkable Part is the Head,
 “ which is cover’d or guarded with Two
 “ Shells, of equal Dimensions, fix’d one on
 “ one side, the other on the other, and run-
 “ ning out, forward, each to a sharp Point,
 “ with each of which these Worms can
 “ work, while the other lies still. This Sort
 “ of Helmet, which covereth the Head of
 “ the Worm, is very hard, compar’d with the
 “ Consistence of the Rest of the Body, which
 “ is very supple and tender; dries in the Air
 “ in a little Time, and turns at last to Dust.
 “ The Head, by Means of the abovemention’d
 “ Defence, is of the longest Duration.”

The Worm here described resembles ours
 in Nothing but the Head, and the Manner
 of Life, which the Author proceeds to de-
 scribe, and which we shall relate after him
 in another Place. We have found here in
 open Places, and likewise in Timber, a
 Worm with innumerable Legs, and the Bo-
 dy of which consisted of divers Rings or
 Circles. This Worm is delineated at the full
 Length

Length and Breadth in Fig. 6. But the Head of it is quite different from the Head of That describ'd above, after M. *Deslandes*. And this Sort of Worm we found, upon due Search, to harbour mostly in Fir-Wood; and that this Wood agrees the best with them. We have found others of this Sort, which were much less, but perfectly agreeing in the Make of every Part: And Those we discover'd in Old Planks and Deal-Boards, which had never been in the Water.

The learned Sr. *Antonio Vallisnieri*, Professor of Physick at *Padua*, describes a Worm, * which differs very little from ours, if it is not the same, as the seeming Difference may be owing to the greater or less Accuracy of the Observations on one Side. The Reader may compare the Worm, Fig. B. which is that of *Vallisnieri*, with that delineated Fig. 1. which is ours.

* The First Collection of the Remarks of Sr. *Vallisnieri*, printed at Venice 1710. in Octavo, p. 220.

He calls the Sort he describes, the Vermin of Ships, and says (a) "it is a Sort of Sea-Worm" which nestles into those Parts of a Ship, which are always under Water, and chiefly into the Planks which are nearest the Surface of the Water; that they fasten themselves up in the Wood, each in its particular

(a) Una razza di tarli, o Vermi di Mare, che annida in tutte quelle Tavole delle navi che stanno sempre sott' acqua, le più vicine al livello della medesima, è colà stanno rinchiusi, ciascuna da per se in proprio (*) tubo, o canuello di materia testacea

* Figura di A

lar Cell or Channel, which runs winding
and tapering to a Point, after the Manner
of a Sea-Shell; is open at both Ends, and
always as long as the Worm that inhabits
it; that these Worms are of divers Sizes,
according to Diversity of Age; but that
the Longest of them exceed not the Half
of a Florence-Ell; and that these are of
about the Thickness of the Little Finger.

At that End of the Worm, where the
Head is (continueth this Author) there
are Two little Bones, of a semi-cir-
cular Form, *DD*, concave on one Side, and
convex on the other, running out some-
what disproportionately towards the Ends.
In the Middle, between these Two Bones,
the Head is discover'd. At the Tail-End
there are seen a Couple of a Kind of Fins,
of a bony Substance, *EE*, which are fas-
ten'd to a Sort of String or Binding, *S*, of
a finewy or fibrous Consistence. Between
these Fins there are two long, round, fleshy
Tails, *FH*, hollow and open at the Ends.

Ex-

di figura di conto, da ambedue l'estremità aperto, e lungo, quan-
to le Brume stesse, delle quali, secondo l'età, vene sono di
grandezze diverse, ma le maggiori non passavano la lunghezz-
za di un mezzo Braccio Fiorentino, ed erano grosse in circa
quanto il dito minor della mano.

† Page 221. † Nella estremità anteriore, scorgonsi † due ossa semi circu-
lari *D. D.*, da una parte concave, e dall'altra convesse, aventi
alcune appendici irregolari, in mezzo di quali ossi sta situata la
† Fig. B. testa. Dall'altra estremità opposta miransi due pinne ossee *EE*
impiantate nell'un certo cordone *S* composto di fibre nervose,
nel

" Excepting the two little Bones at the
 " Head, and the two Fins at the Tail-End,
 " this Vermin hath neither Bone, Fin, nor
 " Gristle. Both great and small are of the
 " like Matter or Substance, which nearly re-
 " sembles that of an Oyſter, having an Oy-
 " ſter-like Colour and Taſte, but not the
 " like Firmneſs, for the Substance or Body
 " of this Worm is ſo extremely ſoft and ten-
 " der, that it can hardly be touch'd without
 " Breaking, or loſing its Continuity." The
 Author then proceeds to deſcribe the Trunk
 or Cell, which this Worm, in its Marches,
 prepares for its Lodging.

Let us now conſider a little the Difference
 between theſe Worms deſcrib'd by this lear-
 ned Author, and which were found in the
Venetian Sea, and the Worms which we now
 ſee upon our own Coaſts.

I have not only at ſeveral proper Places
 made careful Remarks on this Vermin of
 ours, by narrowly conſidering more than a
 Thouſand of them, of different Dimensions,
 which I diſcover'd in the ſeveral Pieces of
 Wood I open'd at theſe Places, but I now

B 2

like-

nel mezzo delle quali pinne ſono ſituate due lunghe e retonde
 appendici carnoſe *F H* internamente ſcanellate, ciaſcuna delle
 quali ha la ſua propria apertura in punta. Tolti via i due oſſi
 della teſta e le ſudette due pinne, non ha in ſe la Bruma altri oſſi,
 ne ſpina, ne cartilagini; ma tanto le Brume piu picciole quan-
 to le piu grandi ſono tutte d'una ſoſtanza muſcoſa, ſimile a
 quella delle Oſtriche, del medefimo colore e ſapore, ma pero
 piu gentile, e d'una molezza e fragilita coſi grande, che per
 poco che ſi maneggiano, con grandiffima facilità ſi diſfano.

likewise keep several of them by me, which I feed, and still carefully consider, in order to give the greater Extent and Accuracy to the Observations I shall lay before the World concerning them.

On the Surface of the Wood that is inhabited by these Creatures, Nothing is to be perceiv'd besides little Holes or Inlets, of Diameters no larger than that of a Quarter-Line. * By these Holes the Worms enter the Wood; and being enter'd, they never return: They attack as well Oak as Fir and Elder; are very ravenous and destructive, and grow in a small Time to their ordinary Bigness. But I cannot as yet say any Thing of the Manner in which they are generated, whether it is done by *Ova*, or whether they are the Issue of Putrefaction or of any other known Means of Generation. We shall perhaps have an Opportunity after the Dog-Days (when we shall have the properest Season for making Observations on this Head) to make a clear Discovery of it.

It appears from the Report of the Deputies, † appointed to inspect the State of the Dykes, that on the 12th of *November* 1731, being met together near several Parts where it was suspected this Vermin was lodg'd, they caus'd a Pile, which had been driven down in the Sea in the Year 1718, to be drawn out. When it was brought ashore, it appear'd to be sound and perfect; but, being split in
Two,

† The Report of
Drechtter-
landt.
Jan. 12th
1731.

Two, it was found to be gnaw'd through and through by Worms which were lodg'd in it; some of which were of an extraordinary Size, being Fourteen Inches in Length, *Amsterdam Measure*: And the Channel or Burrow which they had made in the Pile, and which ran along evenly with the Grain of it, was large enough for a Man to lodge his Finger in it.

The Inspectors of another Quarter reported,*that having caus'd a large Pile, which was almost new, to be taken out of the Sea and split, they found it from End to End pierc'd through in little Holes, of about the Diameter of the Shaft of a Tobacco-pipe.

* Re-
port Feb.
29th 1732.

Among all the Worms which I saw on the Coast of *North Holland*, I found none that were more than Eight Inches in Length. The Bodies of These were the Diameter of a Fathom Line from the Head, and a Quarter of an Inch thick; their Helmets, or Head Armour, near one third Part of an Inch thick; and their Shape such as is delineated in Fig. 1.

The Head is somewhat like a Navel inverted, but in Length not above the Diameter of a Line 'Tis of a finewy Substance, like that wherewith the Muscle-Fish is fasten'd to the Shell. The Part *r* represents the Mouth of the Worm, which resembles the Mouth of a Man that grins and distorts his Lips into Wrinkles. This Part is encompass'd, but not cover'd, as
Vallif.

+ Fig. 1.

Vallisnieri says of the Worms he describes, with a Sort of Helmet *n, a, ** which Helmet doth not consist of Two Bones, as *Vallisnieri* says of the Helmets of his Worms, but of Two separate Shells, each having the Form of a Half Snail-Shell; that is, they look, together, like a Snail-Shell cut in Two. One of these Shells is on the right Side the Head, the other on the left: And they are exactly of the like Dimensions. Each of them may be divided into three Parts.

† Fig. 3. The Part *a, e, c, ‡* may be reckon'd the Gorget, or Neck-piece; *e, o, t, i,* the Head-piece; and the Triangle *i, r, n,* the Crest or Crown of the Helmet. The Outside of the Neck-and Head-piece, both which Parts are distinctly delineated in Fig. 3. corresponds exactly with that of a Snail or Sea-Shell. But

† Fig. 5. the Triangle *i, r, n, †* has a different Face, being whiter than the other Parts, and cover'd with little Notchings which run Stripe-wise from the Angle *n* to the Angles *i, r*. So that it seems to the Touch of the Finger to be somewhat round, and to have the Roughness of a File or Rasp. The two Shells united compose the whole Helmet, the Use of which we shall explain hereafter. It may be observ'd from the two Figures *B* and *1,* that this Helmet is somewhat different from that describ'd by *Vallisnieri*. The said

|| Fig. 1. two Shells are fasten'd to the Body at *n, ||* which Part I call the Neck, by a finewy

Sub-

Substance or Skin, like that which holds the Muscle to the Shell. They are again conjoin'd at the Hind part of the Head, by a Skin or Substance of the same Kind. And they are so dispos'd, and the two Angular Points * at *n*, are contriv'd in such Manner, that when the Worm turns its Head, they play or describe reverting curve Lines, like the Fly of a Watch. One of these angular Points is somewhat more extended than the other: The Rest of the Worm, from the Helmet backwards, is divided into two very unequal Parts. The Fore-part *n, d*, may be call'd the Body or Trunk, because it contains the Entrails. This Part consists of a white, fattish, and Marrow-like Matter, nothing near so firm as that of an Oyster, and is in Thickness, two Thirds of the Diameter of the Helmet. The Hind-part, *d, b*, which is lean, of a Grizzle Colour, and of but half the Bigness of the Fore-part, which I have call'd the Body or Trunk, may be term'd the Tail; which terminates with a Binding or Girdle-like Protuberance, *b*, of a Substance nearly approaching to that of the Head, but not of that Make or Shape, which *Vallisnieri* describes on the same Parts of his Worms, *S*, Fig. *B*. At this Girdle begins an Appendix, consisting of Two Branches, † (*s. s.*) which by *Vallisnieri* are call'd Fins; but they are very different from what he describes under that Appellation, Fig. *C*, or *E E*,

* Fig. 3.

† Fig. 1.

E E, in Fig. *B*. For he says (*a*) " Their
 " Tails are remarkable, being arm'd with
 " two Blades or Swords, each in the Figure of
 " a Leaf, and towards the Inside somewhat
 " concave." What I term the * Branches in
 * Fig. 1.
 † Fig. 4. our Worms, are in Length the Diameter and
 half Diameter of a Line; very narrow near
 the Girdle, to which they are fasten'd.
 They are split at each Extremity about the
 Diameter of a Line, after the Manner of a
 Goats Foot. Their Outsides are convex,
 and their Insides a little concave. They are
 so white, smooth and bright, that they may
 be taken for Ivory. They are of a shelly
 Substance, and harder than the Helmet. Be-
 † Fig. 1. tween these two Branches, are two little Tails
 † (*o, r*, and *o, t*) one of which is streight and
 open; the other is somewhat bent at the Ex-
 tremity, after the Manner of a Horn. Each
 of these little Tails is one Fourth of the
 Diameter of a Line, The Worm can leng-
 then, flatten, inflate and contract them as he
 pleases. I have sometimes seen the Worm
 lengthen the Tail *o, r*, near an Inch; but the
 Tail *o, t*, is never extended to such a
 Length as the other.

I have open'd several of our Worms, but
 never discover'd in them a Heart, or any
 Thing that corresponds with the following
 Ac-

(*a*) La loro coda è considerabile, essendo armata di due la-
 mine di figura come foglia alquanto concave verso la parte in-
 terpa.

Account which Sr. *Vallisnieri* gives of what he discover'd in the Bodies of the *Venetian* Worms. " They have (says he, *b*) a Heart " under the Maw, pretty nearly of an " Oval Figure, appearing like two little Pil- " lars; which contracts and dilates it self, " in order to drive the pure refin'd Blood " through the Arteries, which Blood circu- " lates throughout the whole Body, and re- " turns again to the Heart." I have only discover'd a little oblong Bag, about an Inch long, a little more or less, according to the Bigness of the Worm: And underneath this little Bag, towards the Back, I discover'd another small Vessel, which is, perhaps, the Receptacle of the Eggs of this Creature. This little Bag, which is probably the Maw, was fill'd with what might be easily discern'd to be the Powder of Wood, but which resembled the Flower of Bucks-Horn. Between this little Bag and the other small Vessel, there runs a long Gut from the Head to (*c*). And all along the Tail there runs a square Channel, which is fill'd with Matter of the same Kind with that which is found in the Maw; but it takes a different Colour at *d*, where it is reddish; and from

C thence

* Fig. 1.

(*b*) Hanno il loro Cuore, il quale è sotto il Ventricello, di figura ritondutra bislungo, in forma quasi di due Colonnette, che ad occhi veggenti si dilata, e si stringe e caccia fuori, per le sue arterie, un sangue diafano e trasparente, che circola per tutto il corpo per li necessari bisogni, o per le vene ritorna al Cuore.

thence to the Girdle *b*, it falleth away gradually into a brown, and, finally, into a dark Colour: And this, without Doubt, is the Cause, that the Tail is of a different Colour from that of the Body or Trunk. Such is my anatomical Account of this Worm. We will now consider a little his Operations in a Piece of Timber.

But it were proper to deliver in this Place, if we were able to do it, a regular Account of the original Residence of those Worms, or from whence they were transported to us, and of the Manner in which they are generated. We have Nothing to advance on the First Head, but what is merely conjectural. Some are of Opinion, that these Worms were brought by our Ships from *America*. But we may firmly conclude, that this Opinion is groundless, since we do not hear, that ever those Worms were seen in the *American* Seas. But the Sort of which M. *Deslandes* speaks *, and which our Carpenters and Seamen term *Thousand Legs*, is very well known there. 'Tis by far more probable, that they come from the Seas far Northward; for they are found in mighty Numbers upon the Coast of *Iceland*: And such an Opinion might be supported by the following Matter, namely, that this Vermin spawns not but in the Dog-Days; that is to say, only at the Season when the Sea-Waters this Way are most warm'd by the Sun; for if, on the

* See
the Place
before re-
fer'd to.

the other Hand, they come from a Climate that is between our own and the *Torrid Zone*, it should seem an indifferent Point to Nature, whether this Vermin was produc'd in the Dog-Days or any other Part of the Summer, or Year, the Heat in a nearer Climate being nearly always as great as it is within the Dog-Days.

As I have observ'd these Creatures only since September last, I have not had an Opportunity to remark any Thing of Weight, touching the Manner in which they are generated: So that, as I have hinted already, whether they are produc'd by *Ova*, or some slimy Matter, or whether they are the Issue of some Putrefaction, is a Matter in the Dark to me, But I shall endeavour, if I live, to discover it next Summer, as well from Observations on Worms on the Coast, as from those which, for that Purpose, I carefully preserve in my own Chamber. 'Tis true, that among the various Kinds of strange Matter, which have been found sticking to the Timber drawn out of the Sea, there have been discover'd Something like empty Eggs. But this helps not a great Deal at present; for this Egg-Shell-like Matter may as well be the Produce of any other Vermin as of those in Question. *Vatlisnieri*, who ventures farther on this Article than we have the Courage to do, explains

the Matter thus: (a) “ These Worms are to
 “ be rank’d with that Sort of Animals
 “ which generate without Coition with a
 “ Male, and are term’d Hermaphrodites.
 “ Their round transparent Eggs, which are
 “ cover’d with a slimy Matter, drive upon
 “ the Surface of the Water till they meet
 “ with some Wood; to which, by Means of
 “ the slimy Matter, they stick fast. After-
 “ wards, says he, while the Eggs are so
 “ fasten’d, they break, and set the Young
 “ at Liberty, which, instantly thereupon,
 “ cling to the Wood, and fall a boring; thus
 “ beginning that Work the very Moment
 “ they break the Shell.” This Account,
 however, is so probable, that I think it
 ought to be admitted for Truth, till we are
 authoriz’d by Experience to reject it. As soon
 as they are fasten’d to the Wood, they use
 their utmost Efforts to get into it; and at
 such time the Breadth of their Helmets can
 hardly exceed the Diameter of a Quarter-
 Line. They are sometimes found from two
 to ten together in a close Body, fasten’d to
 and forcing their Way into a Piece of Tim-
 ber. It has been remark’d, that the Piles
 of

(a) Di quegli che generanno senza consortio del Maschio,
 e come gli chiamao Ermafroditi - - - - - ove ronde, diafane,
 anch, esse accompagnate e circondate da un poco di mucela,
 gine viscosetta, le quali galligiano, e vengono poi gittate dall
 onda del maré apresso le Tavole alle quali col loro visco s’attac-
 cano, e nascono, e le nate picolissime Brume si rivolgono poco,
 dopo verso la tavola, e preso fiato, incomminciano atrapanarla
 ed a fare il medesimo lavoro delli descritte loro madri.

of the *Suyder-Sea* are mostly penetrated at the Lower Ends, about a Foot from the Ground. Holes indeed are found all the Way up the Piles; but the nearer the Top, the fewer they are, and at a greater Distance from one another. The Boreings at the lower Ends of some Piles were so close and numerous. that, as in a Sieve, little was to be seen besides Holes; by which they were so weaken'd, that a very small Force demolish'd them, while at the same Time the upper Parts of the Piles seem'd sound and perfect. The Inside of the Parts that were thick bor'd shew'd a great Resemblance to the Crum or Inside of light Bread, or the Inside of those Biscuits, which abound with Eyes, as they are call'd, or little Cavities and Openings.

When a Worm hath enter'd a Pile, he bores his Way streight forward, or horizontally, till he meets with a Vein or *Stratum* of Wood that is to his Liking. He then turns and marches up the Pile perpendicularly, unless he meets with the Path or Channel of another Worm, for, in such a Case, he departs from the Line, without boreing in the Channel of the other, and strikes up by a new one. And *M. Deslandes*, already quoted, is certainly out where he says, that when two Worms meet, the One kills the other.

They are very ravenous, and make quick Advances in their Boreings, especially the young

young ones; which make wonderful Dispatch: tho' I found, that some young ones, which had enter'd Wood last Summer, and which were then no longer than the Worm represented by *Fig. 7* had advanc'd but Two Inches by the End of October; at which Time they were of the Dimensions of *Fig. 8*.

- *Fig. 2.* 'Tis with their Helmets *, or, more strictly,
 + *r. Fig.* the Points of them † (the Motion of which,
 3, when employ'd is like that of the Ballance of a Watch,) that they penetrate or bore the Wood. And the Dust or Powder of the Wood or Boreings, falling into the Mouth
 || *Fig. 1.* or Receiver, || is the Food of the Worms. As
 r. they advance in their Boreings, the Channels become gradually wider, by Reason of the increasing Growth of the Bodies and Helmets of the Worms, till the Creatures are come to their full Bigness.

As they advance likewise in their Tubes or Channels, a white slimy Matter comes from them, with which they line their Channels quite throughout, to the Thickness of a Card, leaving it very smooth. This slimy Matter, so left, becomes as hard as a Crust, preserving its Whiteness, and looking like a long Shell, or the long Tube or Shaft of a Tobacco-Pipe within another Tube; but it is then exceeding brittle, insomuch that the smallest Force will shatter it, yet it dissolves not in Spirits of Wine. Such are the Manifestions of these Worms: And this Sort of Lining

ning or Plaistering is a Defence for their most tender Bodies against the Roughness of the Wood, which might otherwise tear or hurt them: So that they slide upwards and downwards, or backwards and forwards, without any Incommoding or Embarrassment. And it is not unlikely, that this shelly or crustaceous Lining may defend them likewise against Injuries from Excess of Moisture in the Wood they are lodg'd in, when it stands in Water. *Vallisneri* * gives a quite different Description of this Crust or Shell. p. 220.
& 221.

(a) " It may be observ'd (says he) that they
 " (these Shells) consist of several *Strata* or † Fig.
 " Beds, like the Shells of Oysters or other A.
 " Shell-Fish; and externally they appear
 " compos'd in the Fashion of so many Rings
 " which are thickest at the upper End, that
 " is, at the Widest of the Channel; from
 " whence downwards they become gradual-
 " ly smaller and tenderer. And the thickest
 " Part of the Rings are close fasten'd or fitted
 " up to the Channel || in several *Strata* of ‡ See
 " the same shelly Substance, which are very Fig. A B.
 " hard. And being fitted one upon another,
 " they

(a) E si vede, che sono fatti suoli, o fulde, come i giusei delle Ostrie che è di altre conchiglie marine. Esternamente però appaiono composti in foggia di tanti anelli, i quali principiano dal l'estremità anteriore, cioè della base del cono li fargono molto radi, ma avvicinandosi verso l'altra estremità più sottile, si osservano molto spessi; ed in quella parte appunto, dove i principali anelli cominciano ad apparire così tosti corrispondono loro internamente attaccate al medesimo canello altrettante lamelle

" they defend the whole Channel. And tho'
 " it seemeth that the Rest of the Shell, with-
 " in, should be uneven, yet is the Inside-Su-
 " perficies smooth, and not at all rough, as
 " is the Outside.

When the Shell is loosen'd from the Wood
 and open'd, it is found to be smooth both on
 the In- and the Out-side, without any Joints
 or Rings, as will be manifest to Any one
 who shall examine the Shell carefully.
 What I say here, has Place in Oak and El-
 der-Wood, the Veins or several *Strata* of
 which are not very plainly distinguish'd.
 But Sr. *Vallisneri* made his Observations in
 Plank; and consequently his Account of the
 Matter we are upon may on that Side be
 true. And we must confess likewise, that
 the Matter differs somewhat in Fir from the
 Account we have already given of it: For
 the *Strata* or Beds in Fir (like *ab, bc, cd*) are
 separated by a Kind of Crust, which is of a
 harder, redder, and more resinous Substance
 than the Beds. * While the Worm meets
 with no Interruption, he bores upwards in a
 right Line; and all the Way makes a
 smooth Tube or Shell, without any Rough-
 ness either on the Out- or the Inside. But
 when he meets with any Obstruction, as, for
 In-

* See
 the Lines
d, e, Fig.
 9.

lamelle durissime della stessa materia testacea, le quali sopra po-
 nendo, si l'una all' altra guerniscono all' intorno tutta quella
 estremità del Tubo, i quale, se bene in tutto il restante della
 sua concavità rassiembri alquanto inegale, con tutto ciò la sua
 superficie interna è liscia, e non iscabrosa come l'esterna.

Instance, with the Channel of another Worm, or with a Knot in the Wood, a Nail, or the like, then doth he alter his Course, boring horizontally, through Crufts, if there are any in the Way, till he arrives in another Bed; when he again directs his Course right upwards. The Trouble and Inconvenience he meets with in Crufts makes him pass through them with the utmost Expedition. His Channel in Crufts is narrower than before, and the Ring which he next makes after his coming out of a Cruft, is wider; which is the Reason the Shell, in that Part, seems compos'd of distinct Rings or Circles. But these Rings are so few, that they are hardly perceivable, because the Way of the Worm horizontally, in which Way only these Rings are perceiv'd, is never beyond the Extremity of the Cruft or other Matter he passes through for the gaining a new Bed, or the shunning an Obstruction; which when he has done, his Channel then, which he makes forthwith right upwards, is lin'd with one continued smooth Shell, as before, without Rings or Circles.

The Worm forms his Shell according to the Size or Dimensions he is of. The Shell extends it self from the little Opening *b*, *Fig. 10.* where the Worm enter'd, to *r*, where the Helmet works for the Boreing of the Wood. But it must be observ'd, that even in the largest Piles, or those which are most bor'd, not so much as a single Opening can

D

be

be found, out of which might come a Worm. The Worms having once taken Possession of a Piece of Timber, never peep out of it; the Air and the Water being equally fatal to them; for if either the one or the other penetrates them, they die.

We have given an Account of the Structure and Employment of the Fore-part of this Creature: We will now consider the Uses to which his Hind-parts are destin'd. This Worm hath almost always its little Tails * in the Water. He slips them out at the little Opening where he enter'd the Wood; which now only serves him for this Purpose, and as a Vent to respire by, for he has no other visible Means of Respiration. Tho' he be advanc'd 4 Feet in the Timber, he slides back presently, and dabbles his Tail in Water. *Vallinieri* is of Opinion, " that the little
" Tail o, r, serves as a Pipe or Pump for conveying the Sea - Water to the Head or
" Mouth of the Creature, in order to his
" moistening, and thereby softening the Matter he is to bore; and that by this Means
" he prevents the Wearing out of his Helmet." This, though not truly judg'd, is very ingeniously imagin'd. I preserve several of our Worms in a Piece of Timber that stands in Water in my own Chamber; and have observ'd, that they keep their little Tails almost constantly out at the little Holes by which they enter'd the Wood; and that they sometimes lengthen and sometimes shorten

tén one of the Tails, sometimes more, and sometimes less. *b, c*, is always streight, and may be much lengthen'd; but *b, d*, the crooked Tail, remains, as I have already said, always in the same State. *b, c* is sometimes seen moving and shaking. But upon the least Motion that is given to the Wood or the Water, both the Tails are seen to be drawn gradually in; but not always entirely, for the extreme Part *e*, after such Drawing in, is frequently seen to remain out the Diameter of a Line, flabbing upon the Side of the Timber, like an empty Gut. When the Motion ceaseth, the End of the Tail, which remains out, is inflated and borne up again; and both the Tails are again flipt out, as before.

Through one of these little Tails (I take it to be *b, d*) the Worm discharges its Excrements, which are of a brownish Colour, and like fine *Vermicelli*. Through the other he respire, and draws up what Moisture he hath Occasion for. And I fancy it is by Means of the Tail *b, d*, that these Creatures perform the Business of Generation. I shall, as I have said, if I live, endeavour to come at Certainties on this Head the next Dog-Days. In the mean Time I affirm the following Matter for a Truth. The last Dog-Days, I saw, on the Side of a Frigate in the Harbour of *Medenblick*, the little Tails of two Worms out at Two Openings which were close to one another; and the Tails closed

and folded with one another. The Tails being thus join'd, their extreme Parts were cover'd with a reddish Sort of Froth or Foam; and in a few Minutes after, the Tails were separated and drawn in again. This looks to me like the Act of Copulation; and the more so, in Regard I have never once at any other Time seen these Worms shoot out their little Tails, when the Timber, on the Part they were lodg'd in, was out of Water; as was the Frigate where I saw this Matter, for she was refitting.

If my Conjecture upon this Matter be right, the Opinion of *Sr. Vallisnieri*, that these Worms are Hermaphrodites, or both Sexes in one Body, is destroy'd. The Opinion of *Vallisnieri* is likewise that of *M. Deslandes*, who conjectures, that the Eggs, by which those Vermin are propagated, are laid on the Superficies of Wood by Worms of the same Class. " For (says he) it is not likely
 " that those Worms which have once enter'd Wood, should generate by Copulation,
 " since every one is, as it were, lock'd up in
 " the Wood, as in a Prison, out of which
 " it is not likely that they should come out
 " and appear upon the Superficies. 'Tis
 " probable, the Sea-Worms I speak of can
 " live as well in Water as in Wood; but
 " that in Wood only, they find that Food
 " which is most agreeable to their Palates,
 " and most promotive of their Growth.
 " For this Reason it is, that Water-Worms,
 " which

" which are impregnated by Copulation in
 " that Element, look for Wood to lay their
 " Eggs on ; and that the Worms which are
 " produc'd from those Eggs, give up, by en-
 " tering the Wood, their natural Right of
 " Copulation. So that this Wood-Species is
 " propagated by the Species inhabiting the
 " Water, which is ~~not~~ perhaps but little
 " known to be the same.

This is like a Man's breaking his Neck to rid himself of all Trouble. Parents and Children that are but little known to be the same Species is a knocking down Argument, that will do the Business of every Opposer without a *Perhaps* at the Back of it.

The Fishermen upon the Coast affirm, they never saw any of these Worms in the Water alive. They have indeed seen some that were dead ; but these were such as had come out of broken demolish'd Piles.

Touching the Use of the little Legs or Claws *s, s*, it is not improbable, that they are provided with them for the Purposes of clinging their Bodies to the Inside of their Cells, or Channels, and of ascending and descending, by that Action, from the Top of the Cells to the small Opening or Vent at the Bottom, and thence back again, whenever they have Occasion to discharge their Excrement (for Nothing like Excrement is found in the Cells) or want, as *Sr. Vallisnieri* will have it, to pump up Water, (for None can enter at the Top) or whenever they want a free Respiration

tion (for not the least Breath of Air can enter their Cells but at the Vent or Bottom) or whenever they seek for Copulation, if they are propagated that Way. These Claws and the Helmet are the only Parts of this Vermin that can be term'd hard or firm. All that lyes between, which may be term'd the Body, resembles the Flesh of an Oyster, but falls short even of that in Consistence or Firmness.

I must now observe, that in all the Pieces of Timber which have been split for the Discovery of these Worms, not a single Cell or Channel has been found which pass'd through, broke in upon, or was perplex'd or entangled with another. The Channels run all perfectly clear of one another ; but they are sometimes at no greater Distance than the Thickness of a Card, Where I have said, that these Worms bore in a right Line or Perpendicular from the Bottom to the Top, I must be understood of such of them as enter Piles that stand erect in the Sea ; upon which Piles the Seed or Eggs of this Vermin are plac'd at about a Foot from the Ground for the lowest ; and in that very Place where the Seed or Egg is fix'd, the Worm enters. From about a Foot from the Ground upwards, the Vents or Openings decrease in Number gradually, so as that at the Height of 3 or 4 Feet from the Ground but very few are to be seen, The Channels in these Piles run up to about the Distance of a Foot from the ordinary Height of the Water ; between

tween which Part and the Parts where the Vermin enter'd, the Piles on the Inside abound with Holes, like a Sieve. Sometimes there is not sufficient Room and Sustenance in these Piles for all the Worms that are produc'd from the Seed or Eggs that are fix'd on them, which, as I have said, is done nearly or mostly at the same Distance from the Ground. This is the Cause that some perish in the Piles: And those only have the best Chance, or are the best accommodated and provided, which enter the Piles first. In the Timber which lies flat, as do the Beams of the Dykes, lying either across the Piles, or being driven end-ways between them, the Worms bore and make all their Way horizontally, at whatever Part they enter. I once found a Piece of Lath, an Inch and a half thick, in which were Thirty Two Worms, which had bor'd thirty two Channels, all of the like Dimensions, and as streight and regular, as if they had been made with the Wimble.

When these Worms enter the Outside Planks of Ships, they bore fore and aft in a Path right along with the Grain of the Wood. And as they never bore quite through, or abandon or come out of the Wood they have enter'd, but perish with it, if not some of them sooner for Want of Sustenance, they are, on that Account, of less Danger to Shipping, than it may be generally apprehended.

I have now deliver'd the Total of the Observations I have hitherto made concerning
this

this Vermin, and which I made in order to pave the Way for a Discovery of proper Means to rid our Coasts, that is to say, our Dykes and Pile-Works, of this troublesome Enemy. And as it abundantly appears, that these Creatures live wholly in Timber, not one of them having been found alive in the Water, the Earth, or the open Air, or in any other Matter than Wood; and that they never abandon or come out of the Piece they have enter'd, Nothing can be more false and ridiculous, than the Reports that have been spread concerning the Damage the Country hath sustain'd, and the Danger to which it hath been expos'd by these Vermin, as if they had devour'd or demolish'd its Fences, and set it on the very Brink of Ruin. It might as well be said, that they can undermine or eat their Way through the Dykes, or devour Stone or Iron.

I have but one Remark to add; and that is, that as the Eggs or Spawn of these Creatures is only yielded, or appears only in the Dog-Days; it then being to be seen sticking on the Outside of Timber; so Ships are in no Danger of being invaded or attack'd by them at any other Time of the Year, though they should lye in an Harbour that abounds with this Vermin.

F I N I S.

B 8 L